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FEDERAL COMMUNICATIONS COMMISSION
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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

ORIGINAL
FILE

In the Matter of

Revision of Part 22 of the
Commission's rules governing
the Public Mobile Services

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CC Docket No. 92-115

COMMENTS OF COMP COMM, INC

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October 2, 1992

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COMMENTS OF COMP COMM, INC.

Comp Comm, Inc. ("Comp Comm") hereby submits its Comments in the Revision of Part 22 of the Commission's rules governing the Public Mobile Services, CC Docket No. 92-115.

Comp Comm, through its technical principal, Dr. George L. Schrenk, is qualified to discuss this Notice of Proposed Rule Making. Comp Comm is an engineering and information service company specializing in the Communications Common Carrier Industry. Comp Comm has developed and maintains a proprietary, up-to-date, computerized data base for all FCC Part 22 communications common carrier land mobile operations. Furthermore, Comp Comm is regularly engaged in providing engineering consultation and communication system design services covering all technical aspects of Part 22 Public Mobile Services.

George L. Schrenk, Ph.D. is the President of Comp Comm. He holds B.S., M.S., and Ph.D. degrees in Physics from Indiana University and an Honorary M.A. degree from the University of Pennsylvania. He is also a Professor on the Engineering Faculty of the University of Pennsylvania. His qualifications are both a

matter of public record and are also reported in American Men and Women of Science and other biographic publications. He has testified as an expert witness in engineering matters relating to the communications common carrier industry engaged in Public Mobile Services both before numerous state Public Utility Commissions and before the Federal Communications Commission.

SUMMARY

Extensive comments are made on a large number of technical and engineering matters in the Proposed Part 22 Rewrite.

DISCUSSION

This document contains a series of extensive comments on a large number of technical and engineering matters in the Proposed Part 22 Rewrite.

This document is organized to follow the organization of the Commission's NPRM. Detailed discussion is included in each applicable section along with a series of proposed rule changes.

It is important to note that while this document proposes specific rounding procedures for all metric values, no attempt has been made to identify all locations in the NPRM that need to be modified. Specific rounding changes are made only in those parts where there is also considerable technical discussion.

Subpart A-Scope and Authority

Discussion

Several definitions in §22.99 Definitions need to be revised and/or added.

Specific Rule Changes

Proposed §22.99 Definitions

The following definitions need to be revised:

Interfering contour. The locus of points surrounding a transmitter where the signal from that transmitter is considered to be sufficiently attenuated so as not to cause interference at the service contour of another transmitter.

Service contour. The locus of points surrounding a transmitter where the signal from that transmitter is considered sufficient to provide reliable service to mobile stations. These points are computed by using the appropriate service contour distance formula in the eight cardinal radial directions; all points between the eight cardinal radial directions are determined from these eight contour distance determinations by using linear interpolation of contour distance versus angle.

The following new definitions need to be added:

Interference. Interference from co-channel base transmitters is considered to occur when the interference contour of a base station overlaps the service contour of a co-channel base station entitled to protection.

Secondary use. Operation of a transmitting facility wherein the operation is authorized only so long as it does not disrupt the operation of nearby systems.

Subpart B-Application Requirements and Procedures

Discussion

Several sections need to be modified:

- §22.115 Content of applications needs to have additional important information added concerning how transmitter output, effective radiated power, and antenna elevations are to be specified. The material being proposed has been adopted from §73.212 of FCC Broadcast Rules.

- §22.147 Authorization conditions needs to be modified:
 - Paragraph (a) uses the term "actual interference" without the term being defined. This term should be replaced with the term "interference" for which a specific definition is being proposed.

 - Paragraph (b) uses the term "actual interference" and is concerned with the use of a mobile channel as a base or fixed transmitter. Interference from the fixed use of a mobile frequency is different than "interference" from co-channel base stations; this is particularly true since FCC Rules do not provide any mechanism for calculating the required separation of an elevated fixed mobile transmitter from a nearby elevated fixed mobile receiver. Absent a good definition of "interference" for this situation, it is proposed that all use of fixed mobile transmitters be licensed on a "secondary" basis only. Accordingly, this paragraph should be deleted.

- §22.157 Distance computation needs to have a paragraph added that specifies that all distances should be rounded to the nearest kilometer. The procedures being proposed in this section for calculating distances are contained in §73.208(c) of FCC Broadcast Rules. The proposed paragraph has been omitted in the transcription. This paragraph is important and should also be adopted.

- \$22.159 Computation of average terrain elevation needs to be modified as follows:

The results of all average terrain elevation determinations should be specified to the nearest meter.

Paragraph (c) considers the FL Counties of Dade and Broward needs to be modified to permit rather than require the use of a 3 meter constant elevation. The use of digital elevations for these counties should not be excluded. The requirement that a 3 meter constant elevation be used for these two counties significantly complicates the use of digital terrains in neighboring counties.

There is currently no readily available 30 second or better digital data for PR, HI, AK, GU, and VI; accordingly, the use of manually calculated terrains needs to be permitted for these areas.

Applicants should be permitted to use manually calculated terrains at their own option. There is no reason to require the use of digital terrains.

The source and method of determination of radial information should be specified on 401 applications.

- \$22.165 Additional transmitters for existing systems needs to be modified as follows:

Paragraph (d)(1) needs to be modified to distinguish between VHF and UHF transmitters and 931 MHz transmitters. This distinction is necessary to reflect the 931 MHz changes being proposed in §22.537. Also, it should be modified to reflect the requirement that in-building radiation systems should not be permitted to be located outside of a protected composite service area.

Specific Rule Changes

Proposed §22.115 Content of applications

Add the following new paragraphs to this section:

"The transmitter output power and effective radiated power are to be specified in accordance with the following tabulation:

Power	Rounded out to nearest figure
0 to 1 w	0.01 w
1 to 3 w	0.05 w
3 to 10 w	0.1 w
10 to 30 w	0.5 w
30 to 100 w	1 w
100 to 300 w	5 w
300 to 1,000 w	10 w
1 to 3 kw	0.05 kw
3 to 10 kw	0.1 kw

"Antenna heights, ground elevations, and antenna heights above average terrain are to be rounded out to the nearest meter."

"All separation distance calculations and all service and interference contour distance calculations are to be rounded out to the nearest kilometer."

Add the following sentence to Paragraph (2):

"The height above mean sea level of the antenna site must be obtained manually using appropriate topographic maps and shall be rounded to the nearest meter."

Proposed §22.147 Authorization conditions

Paragraph (a):

Replace the term "actual interference" with the term "interference".

Paragraph (b):

Delete the entire paragraph.

Proposed §22.157 Distance computation

Paragraph (h):

Relabel as Paragraph (i).

Insert the following new Paragraph (h):

"(h) All distances should be rounded to the nearest kilometer."

Proposed §22.159 Computation of average terrain elevation

Change the first paragraph to read as follows:

"Average terrain elevation may be calculated by computer using elevations from a 30 second point or better topographic data file. If a 30 second point data file is used, the elevation data must be processed for intermediate points using linear interpolation techniques; otherwise, the nearest point may be used. If desired, average terrain elevation determinations can also be done manually. In cases of dispute, manually determined average terrain elevations shall be used if the results differ significantly from the computer derived averages. The height above mean sea level of the antenna site must be obtained manually using appropriate topographic maps."

Change Paragraph (c) to read as follows:

"In Dade and Broward Counties, FL, average terrain elevation may be assumed to be 3 meters (10 feet)."

Proposed §22.165 Additional transmitters for existing systems

Change Paragraph (d)(1) to read as follows:

"(1) The service and interfering contours of the additional VHF and UHF transmitter(s) must be totally encompassed by the composite service and interfering contours, respectively, of existing operating stations on the same frequency. The antenna location of each additional 931 MHz transmitter must be located within the composite protected service contour of existing operating 931 MHz stations on the same frequency and the interfering contour of each additional 931 MHz transmitter must be totally encompassed by the composite interfering contours of existing operating protected stations on the same frequency. These limitations do not apply to nationwide network paging stations. All in-building radiation systems must be located within the composite service contour of protected stations."

Subpart E-Paging and Radiotelephone Service

ONE-WAY PAGING OPERATION

Discussion

VHF Paging.

The Commissions rewrite of the specification of effective radiated power limits in §22.535 and the proposal to modify the way height-power limits are determined is an excellent proposal. A study of this proposal shows that the basic power limits contained in §22.535(b) are no longer necessary and therefore should also be deleted. The 32 km (20 mi) average contour distance limit, per §22.535(c), together with the maximum ERP limit of §22.535(a) provide a proper control for all stations. If a "perimeter" (non/interior) facility is at a significantly lower elevation, there is no reason why the facility should not be able to utilize higher power up to the maximum permitted in §22.535(a) for interior facilities. Accordingly, modifications to §22.535 are being proposed to reflect the proposal that the §22.535(c) 32 km (20 mi) average contour distance, together with the §22.535(a) maximum ERP limits, control the ERP limits for perimeter (non/interior) facilities.

The proposed §22.537(a)(3) should be deleted. Determination of area of service gained when interference is accepted requires the concept of "C/I" and the determination of signal levels. These concepts are being removed from the rules by the proposal to replace the Carey F(50,50) and F(50,10) propagation curves with

formulas for determining service and interfering contour distances. Accordingly, there is no engineering basis in the revised rules for making an engineering showing under §22.537(a)(3).

§22.537(c) and §22.537(d) propose specific formulas for determining the VHF service contour distance and the VHF interfering contour distance, respectively. We have studied these formulas and find that while the formulas reasonably well reproduces the present 43 dBu Carey service and interference contours for facilities with ERP's < 500 watts and HAAT's < 500 ft, there are differences for greater ERP's and HAAT's. We believe, however, that there are many advantages that come from the use of a formula approach for determining service and interference contour distances. Accordingly, we are continuing to study what, if any, changes in the coefficient and exponents of the proposed formula might be made that would minimize the differences from the values presently determined using Carey curves. We anticipate filing the results of our findings in the Reply Comments. It is important that all parties explicitly recognize that the adoption of a formula approach for determining the VHF One-Way Paging service and interference contour distance removes from the FCC Rules the concept of Signal Strength and the determination of interference via the calculation of a required minimum C/I ratio.

§22.537(c)(2) and §22.537(d)(2) do not have the 0.1 watt lower ERP limit that was proposed and adopted in the Cellular Second Report and Order, CC Docket No. 90-6, adopted March 12, 1992. Accordingly, these sections should be modified to conform with the

Cellular Proposal.

The proposed §22.537 does not clarify at how many points the VHF Service Contour should be determined. Accordingly, we are proposing to add paragraphs that specify that the VHF Service Contour should be determined by the formula in each of the eight cardinal radial directions and that all values for directions between the eight cardinal radial directions should be determined by linear interpolation of the eight cardinal radial contour distances as a function of angle. This clarification is essential so that the determination of VHF Service Contour Distances is uniquely specified in all possible directions. A unique all-direction determination of the VHF Service Contour is essential in order to determine whether or not a proposed facility has an interference contour that overlaps and thus "interferes with" a facility entitled to protection. Moreover, determination of the VHF Service Contour by the use of only the basic eight cardinal values permits the Service Contour Values to be stored as part of the basic station file. The specification of linear interpolation allows all persons using this information to generate the same contour that is entitled to protection.

The proposed §22.537 does not clarify at how many points the VHF Interference Contour should be determined. Accordingly, we are proposing to add paragraphs that specify that the VHF Interference Contour should be determined by the formula in each of the eight cardinal radial directions and as many additional directions as may be necessary to demonstrate that the interfering contour of the

proposed facility does not overlap the service contour of each facility entitled to be protected. This clarification is essential so that the determination of the VHF Interfering Contour is uniquely specified when making an interference showing. Use of more than the basic eight cardinal radials is particularly useful to ensure that a proposed facility utilizing a highly directional antenna does not have an interfering contour that overlaps a protected facility. Use of just the interstation radial is not always sufficient as an antenna can often possess a significant amount of power several degrees from a sizeable null that may be pointed in the direction of a co-channel facility that is to be protected. Use of interfering contours with more than eight values presents no data problems as interference contour values are not proposed to be stored as part of the basic information defining a proposed facility. This information, however, is part of the interference showing in the application and thus is contained in the FCC station files. We have studied this problem and from our experience there is no standard number of additional radials that is applicable for all possible situations. This is a place where engineering judgement must be utilized. This should cause no problem since the responsibility is totally on the applicant and since the Commission is proposing that the applicant be held accountable for this accuracy in §22.147(a).

The proposed §22.559(a) needs to be clarified as to precisely what stations must be considered in interference showings since the VHF Service Contour is computed in only the eight cardinal

directions. It is being proposed that linear interpolation be utilized to define the bounding radials for which an extended co-channel search is required.

The proposed §22.559(b) encompassment exhibit needs to be clarified concerning how many points are required to specify the interference contours. It is proposed that the interference contour of the operating co-channel base transmitters be determined in each of the eight cardinal radial directions by the formula and that linear interpolation be used for all other values. For the proposed facility being encompassed by the operating facilities, it is proposed that the interfering contour be determined by the formula in each of the eight cardinal radial directions and also in as many additional directions as may be necessary to demonstrate that the interfering contour of the proposed facility does not extend beyond the composite interfering contour of the operating facilities. It is also being proposed that additional radials between the cardinal eight radials need not be utilized if the maximum ERP between two cardinal radials does not exceed the maximum ERP of the adjacent bounding cardinal radials by more than 3 dB. Again, this is a place for engineering judgement; the 3 dB cutoff is being proposed to minimize the number of situations where problems might arise.

931 MHz Paging.

There are a number of problems with the 931 MHz proposal. These problems start with the fact that the present table procedure permits perimeter stations to have service/interference radii > 20/50 miles whereas the FCC procedures for assigning channels are based on a fixed 70 mile minimum separation distance. The proposed Tables E-1 and E-2 have the following serious problems:

- Initial filings with AHAAT > 601 m (2001 ft) are not possible.
- The Service and Interference radii of stations contained entirely within the bounds of a multi-transmitter wide-area system are never less than 32/80 km (20/50 mi), regardless of how low their height and power might be.
- There are discontinuities in service/interference distances due to jumps in the table.
- Distances are not specified to the nearest kilometer.

We have studied this problem extensively and have concluded that the determination of service and interference contour distances for 931 MHz Paging Facilities should not be specified by using a table. Just as the Commission is proposing to replace Carey determinations with formulas, determination of service and interference contour distances for 931 MHz Paging facilities can also be done via formulas. The record in CC Docket 88-135 (RM-5555) contains extensive technical showings about 931 MHz propagation. The tables currently in use by the FCC for determining 931 MHz service and interference contour distances were developed from this information. We believe that there are many advantages that come from the use of a formula approach for determining service and interference contour distances over the use

of the proposed tabular approach. Accordingly, we are presently developing formulas that would be appropriate for these purposes. These formulas will have the same form as those presently proposed for VHF Paging Services. They will also yield the results that a 1000 w, 305 m (1000 ft) station will have 32 km (20 mi) service and 80 km (50 mi) interference contour distances. We anticipate filing the results of our findings and the resultant equations in the Reply Comments. The equations to be proposed will have the same form as those being proposed for VHF paging; only the coefficient and the exponents will be different to reflect 931 MHz propagation.

The proposed §22.535(c) is confusing as it applies to 931 MHz paging facilities using distances from the proposed tables. It is unclear whether or not the tables apply to the maximum power of the facility or apply in each cardinal radial direction using the ERP in each cardinal radial direction. Under the formula approach being proposed, no further clarification would be needed as they would apply to each cardinal radial direction. In our proposal, it should be noted that the actual 931 MHz service contour is computed to determine compliance with the height-power limit, but the contour afforded protection and used for allocation/separation purposes is always 32 km (20 mi). Perimeter "protected" facilities are always defined to have a service contour of 32 km (20 mi) and an interference contour of 80 km (50 mi); this results in the minimum separation distance for FCC allocation purposes being 112 km (70 mi). For interior facilities, the actual service contour is used to determine compliance with §22.535(b)

Height-power limits and the actual interference contour is used to ensure that the interference of the interior facility is totally encompassed by the composite 80 km (50 mi) interference contours of perimeter facilities. There is no requirement concerning encompassment of service contour for interior transmitters since they are not entitled to protection; the only requirement being proposed is that the actual transmitter location be contained within the composite 32 km (20 mi) service contours of protected perimeter facilities.

As in the VHF Paging case, the basic power limits contained in §22.535(b) are no longer necessary and therefore should also be deleted. The 32 km (20 mi) average contour distance limit, per §22.535(c), together with the maximum ERP limit of §22.535(a) provide a proper control for all stations. If a "perimeter" (non/interior) facility is at a significantly lower elevation, there is no reason why the facility should not be able to utilize higher power up to the maximum permitted in §22.535(a) for interior facilities. Accordingly, modifications to §22.535 are being proposed to reflect the proposal that the §22.535(c) 32 km (20 mi) average contour distance, together with the §22.535(a) maximum ERP limits, control the ERP limits for perimeter (non/interior) facilities.

§22.537(e) and §22.537(f), under our proposed use of a formula approach, are replaced by entirely new paragraphs.

Administrative Matters.

Several administrative/clerical matters need attention,
particularly:

All metric distances and elevations need to be rounded to
the nearest whole unit.

A clarification is needed that all interference showings
can be either in tabular and/or graphical form.

Specific Rule Changes

Proposed §22.535 Effective radiated power limits

Paragraph (b):

Delete the entire paragraph.

Paragraph (c):

Replace "32.2 kilometers (20 miles)" with "32 kilometers (20 miles)".

Add the following to Paragraph (d):

"All 931-932 MHz paging transmitters whose service contours are entitled to protection must comply with the height-power limits of Paragraph (c) above. All 931-932 MHz paging transmitters that are interior transmitters not entitled to protection must have their transmitting antennas located within the composite service contour of protected co-channel base transmitters operated by the applicant."

Proposed §22.537 Technical channel assignment criteria

Paragraph (a)(3):

Delete the entire paragraph.

Revise Paragraph (c)(2) to read as follows:

"The value used for p in the above formula must not be less than 0.1 watt or 27 dB below (1/500th of) the maximum ERP in any direction, whichever is more."

Add under Paragraph (c) the following section (3):

"(3) The VHF Service Contour is determined by the above formula in each of the eight cardinal radial directions. All values for directions between the eight cardinal radial directions shall be determined by linear interpolation of the eight cardinal radial contour distances as a function of angle."

Add under Paragraph (c) the following section (4):

"(4) All Service Contour distances shall be rounded out to the nearest kilometer."

Revise Paragraph (d)(2) to read as follows:

"The value used for p in the above formula must not be less than 0.1 watt or 27 dB below (1/500th of) the maximum ERP in any direction, whichever is more."

Add under Paragraph (d) the following section (3):

"(3) The VHF Interfering Contour is determined by the above formula in each of the eight cardinal radial directions and as many additional directions as may be necessary to demonstrate that the interfering contour of the proposed facility does not overlap the service contour of each facility entitled to be protected."

Add under Paragraph (d) the following section (4):

"(4) All Interfering Contour distances shall be rounded out to the nearest kilometer."

Revise Paragraph (e) to read as follows:

931 MHz service contour. For paging stations transmitting on the 931-932 MHz channels, the radial distance from the transmitting antenna to the service contour is calculated as follows:

. . . Actual Formula To Be Supplied. . .

(1) Whenever the actual HAAT is less than 30 meters (98 feet), 30 must be used as the value for h in the above formula.

(2) The value used for p in the above formula must not be less than 0.1 watt or 27 dB below (1/500th of) the maximum ERP in any direction, whichever is more.

(3) The service contour of each 931-932 MHz Paging Facility entitled to protection shall be defined as a circle with a radius of 32 km (20 mi) centered on the transmitting antenna.

(4) The 931-932 MHz Service Contour distances used to determine compliance with the Height-power limit of §22.535(c) are determined by the above formula in each of the eight cardinal radial directions.

(5) All Service Contour distances shall be rounded out to the nearest kilometer.

Revise Paragraph (f) to read as follows:

931 MHz interfering contour. For paging stations transmitting on the 931-932 MHz channels, the radial distance from the transmitting antenna to the interfering contour is calculated as follows:

. . . Actual Formula To Be Supplied . . .

(1) Whenever the actual HAAT is less than 30 meters (98 feet), 30 must be used as the value for h in the above formula.

(2) The value used for p in the above formula must not be less than 0.1 watt or 27 dB below (1/500th of) the maximum ERP in any direction, whichever is more.

(3) The interference contour of each 931-932 MHz Paging Facility entitled to protection shall be defined as a circle with a radius of 80 km (50 mi) centered on the transmitting antenna.

(4) The 931-932 MHz Interfering Contour of facilities operated as additional transmitters pursuant to §22.165 shall be determined by the above formula in each of the eight cardinal radial directions and also in as many additional directions as may be necessary to demonstrate that the interfering contour of the proposed facility does not extend beyond the interfering contour of operating protected facilities. Additional radials between the cardinal eight radials need not be utilized if the maximum ERP does not exceed the maximum ERP of the adjacent bounding cardinal radials by more than 3 dB."

(5) All Service Contour distances shall be rounded out to the nearest kilometer.

Delete Tables E-1 and E-2.

Proposed §22.559 One-way paging application requirements

Add the following to the end of the initial paragraph:

"The supplemental information described in this section may be supplied either in tabular and/or graphical forms."

Add the following paragraph under (a)(1):

"(i) The radials that bound the extended search shall be determined as follows. Between a cardinal radial in which the distance to the interference contour is equal to or less than 76 km (47 mi) and a cardinal radial in which the distance to the interference contour exceeds 76 km (47 mi), linear interpolation of distance versus angle will be used to determine the bounding radial directions that correlate with the 76 km (47 mi) interference contour distance."

Add to Paragraph (a)(2) the following:

"The VHF Service Contour of each facility to be protected is determined by the formula in §22.537(c) in each of the eight cardinal radial directions. These determinations shall use the HAAT and ERP values stated in FCC application defining each station entitled to be protected. All values for directions between the eight cardinal radial directions shall be determined by linear interpolation of the eight cardinal radial contour distances as a function of angle. The VHF Interfering Contour of the proposed facility shall be determined by the formula in §22.537(d) in each of the eight cardinal radial directions and also in as many additional directions as may be necessary to demonstrate that the interfering contour of the proposed facility does not overlap the service contour of each facility entitled to be protected."

Add to Paragraph (b) the following:

"The interfering contours of operating co-channel base transmitters shall be determined in each of the eight cardinal radial directions by the formula in §22.537(d) in each of the eight cardinal radial directions. These determinations shall use the HAAT and ERP values stated in the FCC application defining each station being utilized. All values for directions between the eight cardinal radial directions shall be determined by linear interpolation of the eight cardinal radial interfering contour distances as a function of angle. The VHF Interfering Contour of the proposed facility being

encompassed by the operating facilities shall be determined by the formula in §22.537(d) in each of the eight cardinal radial directions and also in as many additional directions as may be necessary to demonstrate that the interfering contour of the proposed facility does not extend beyond the interfering contour of the operating facilities. Additional radials between the cardinal eight radials need not be utilized if the maximum ERP does not exceed the maximum ERP of the adjacent bounding cardinal radials by more than 3 dB."